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Shen et al.

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(54) **APPARATUS AND METHOD FOR BICYCLE PERSONALIZED ADJUSTMENT**

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B60N 2/02; B60N 2/16; B60W 40/09;
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See application file for complete search history.

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(56) **References Cited**

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U.S. PATENT DOCUMENTS

6,484,260 B1* 11/2002 Scott et al. G07C 9/00563
713/186

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6,980,672 B2 12/2005 Saito et al.
(Continued)

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FOREIGN PATENT DOCUMENTS

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CN 1343593 4/2002
CN 101369354 7/2012

(Continued)

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OTHER PUBLICATIONS

“Office Action of Taiwan Counterpart Application”, dated Oct. 26,
2018, p. 1-p. 11.

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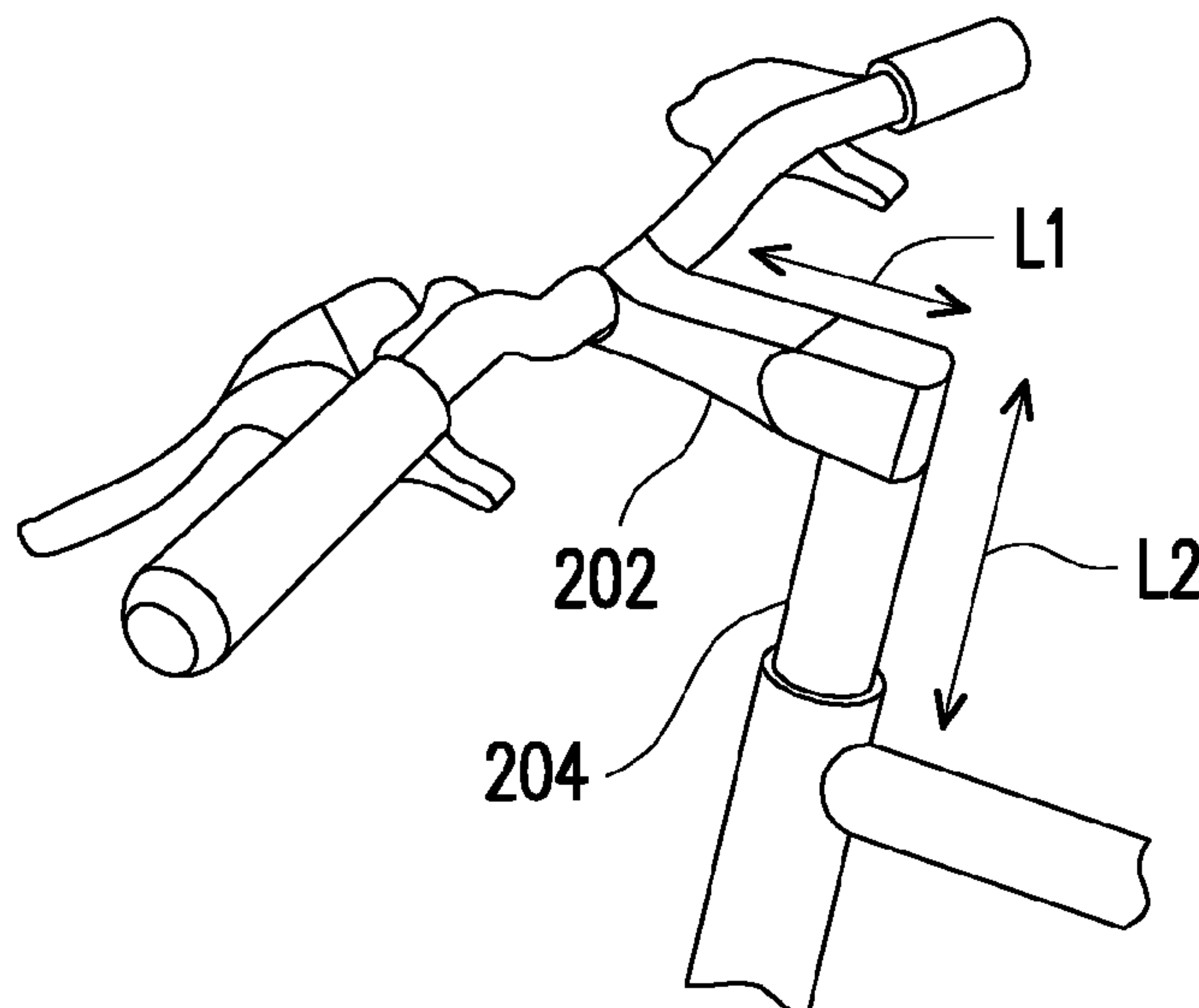
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(57) **ABSTRACT**

An apparatus and a method for bicycle anti-theft and per-
sonalized adjustment are provided. When a biometric fea-
ture of a user matches a preset biological feature, a brake
lever is fixed at a preset position to lock the bicycle, and a
variable structure is driven to make personalized adjust-
ments according to bicycle adjustment parameters corre-
sponding to the biometric feature of the user.

13 Claims, 7 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

7,138,904	B1	11/2006	Dutu	
8,256,560	B2	9/2012	Fiske et al.	
2004/0252013	A1*	12/2004	Fuks et al.	B60N 2/0248 340/5.52
2006/0186987	A1	8/2006	Wilkins	
2009/0226050	A1*	9/2009	Hughes	G07C 9/00563 382/124
2010/0252380	A1*	10/2010	Nguyen	B60R 25/08 188/265
2016/0001782	A1*	1/2016	Fiedler	B60W 40/09 340/5.81
2016/0375908	A1*	12/2016	Biemer	B60W 2040/0809 701/1

FOREIGN PATENT DOCUMENTS

CN	206031621	3/2017
TW	I311114	6/2009
TW	M452109	5/2013
TW	M500057	5/2015
TW	M518651	3/2016
TW	M533678	12/2016

* cited by examiner

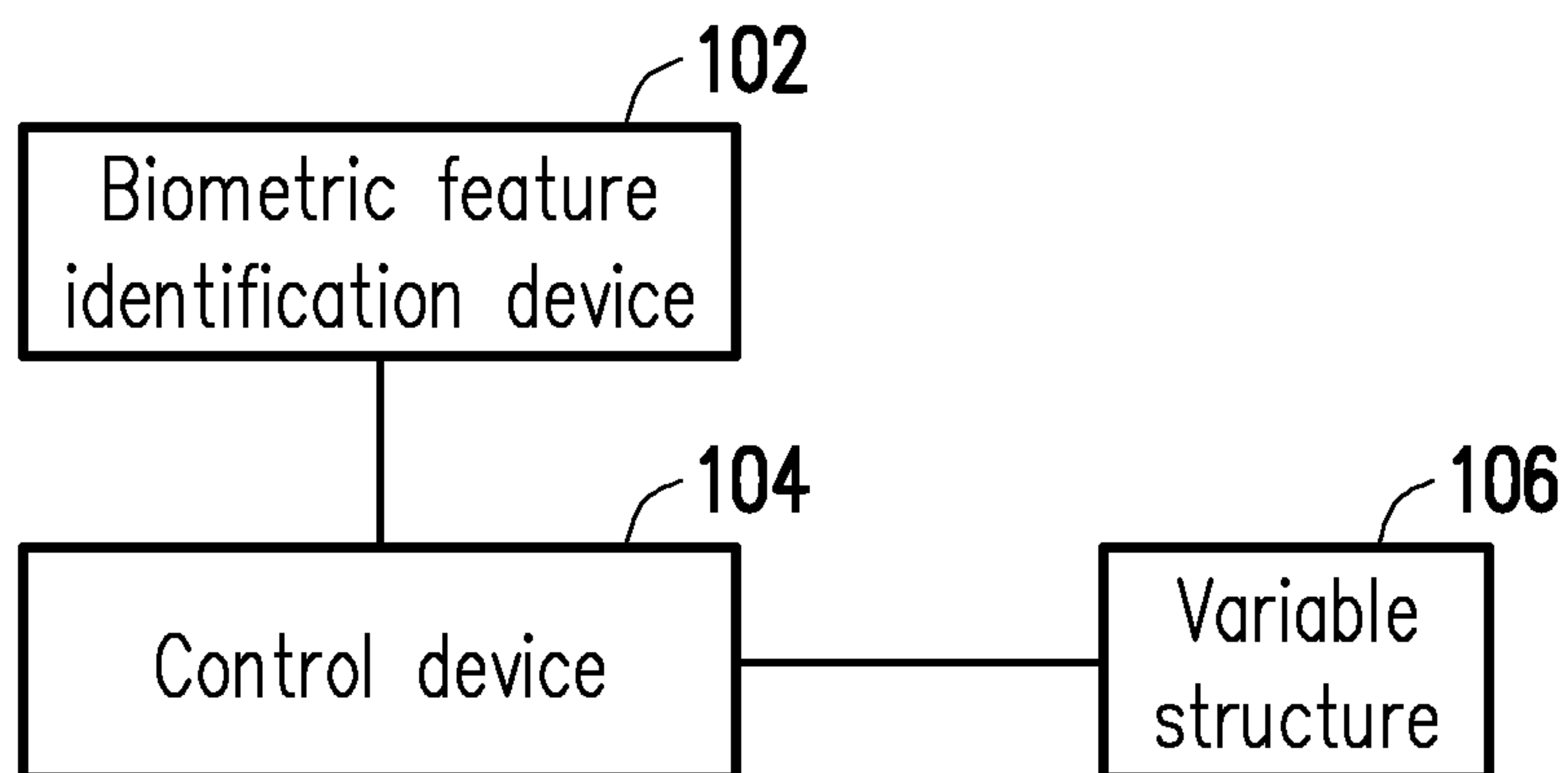


FIG. 1

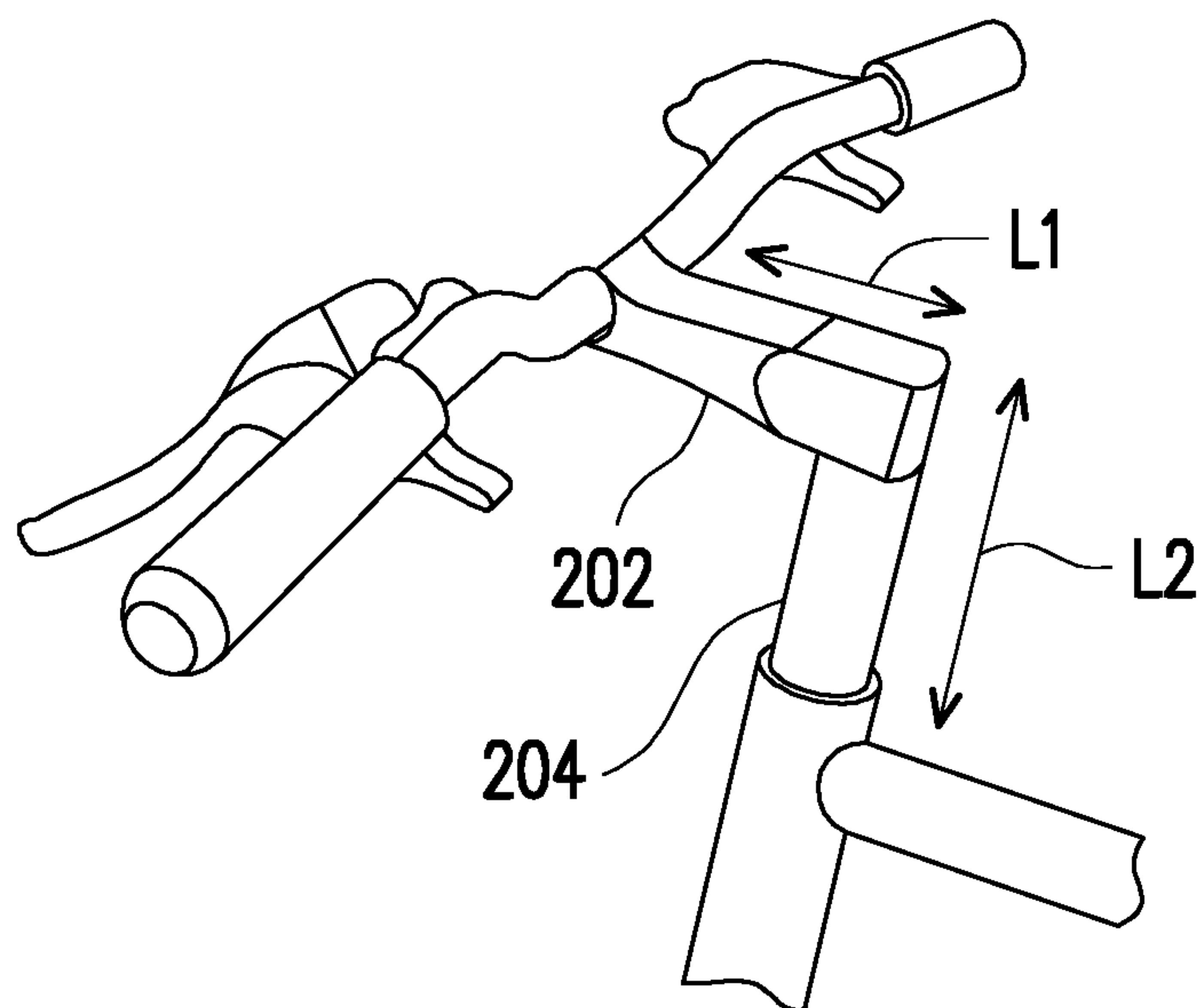


FIG. 2

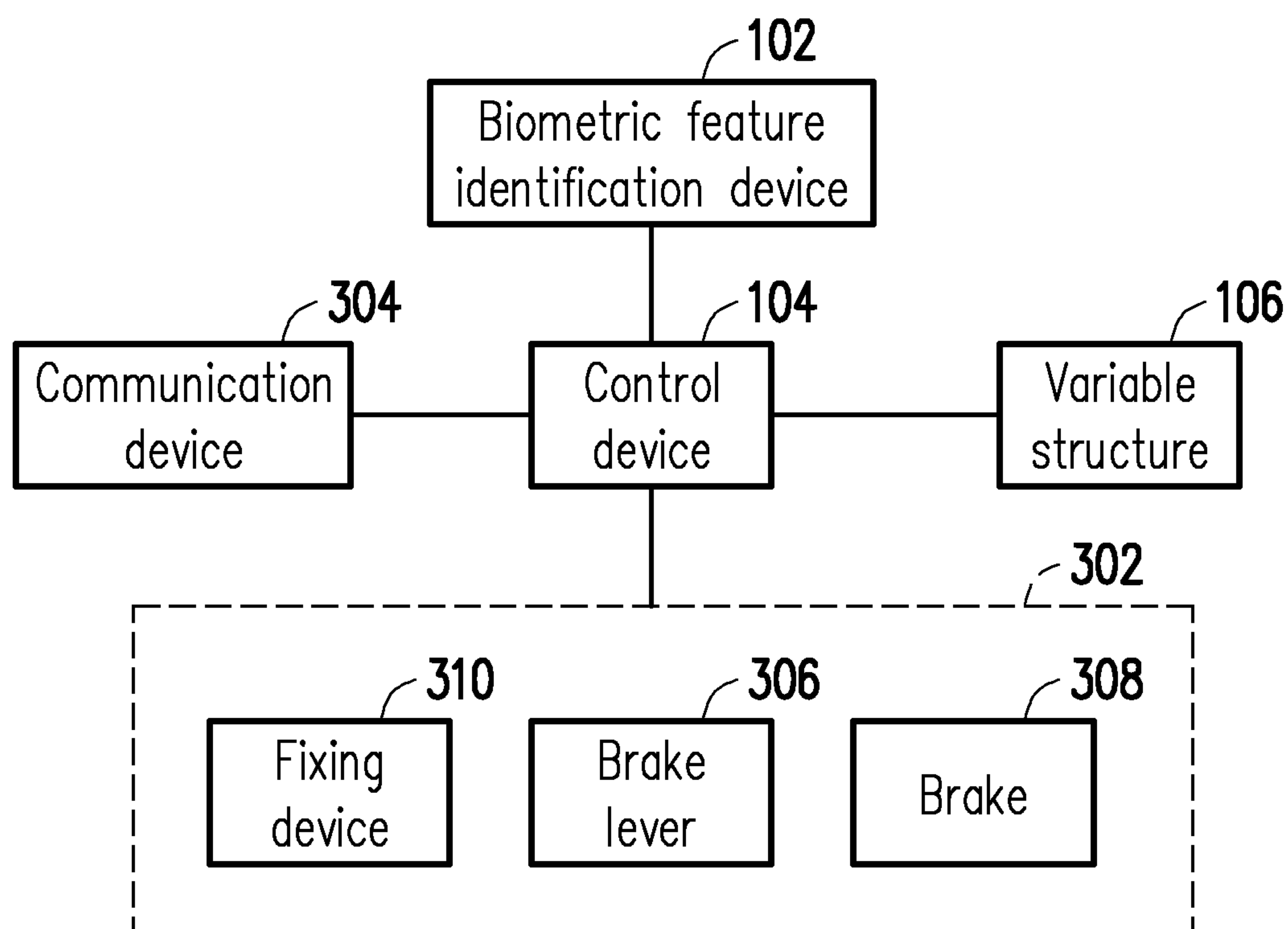


FIG. 3

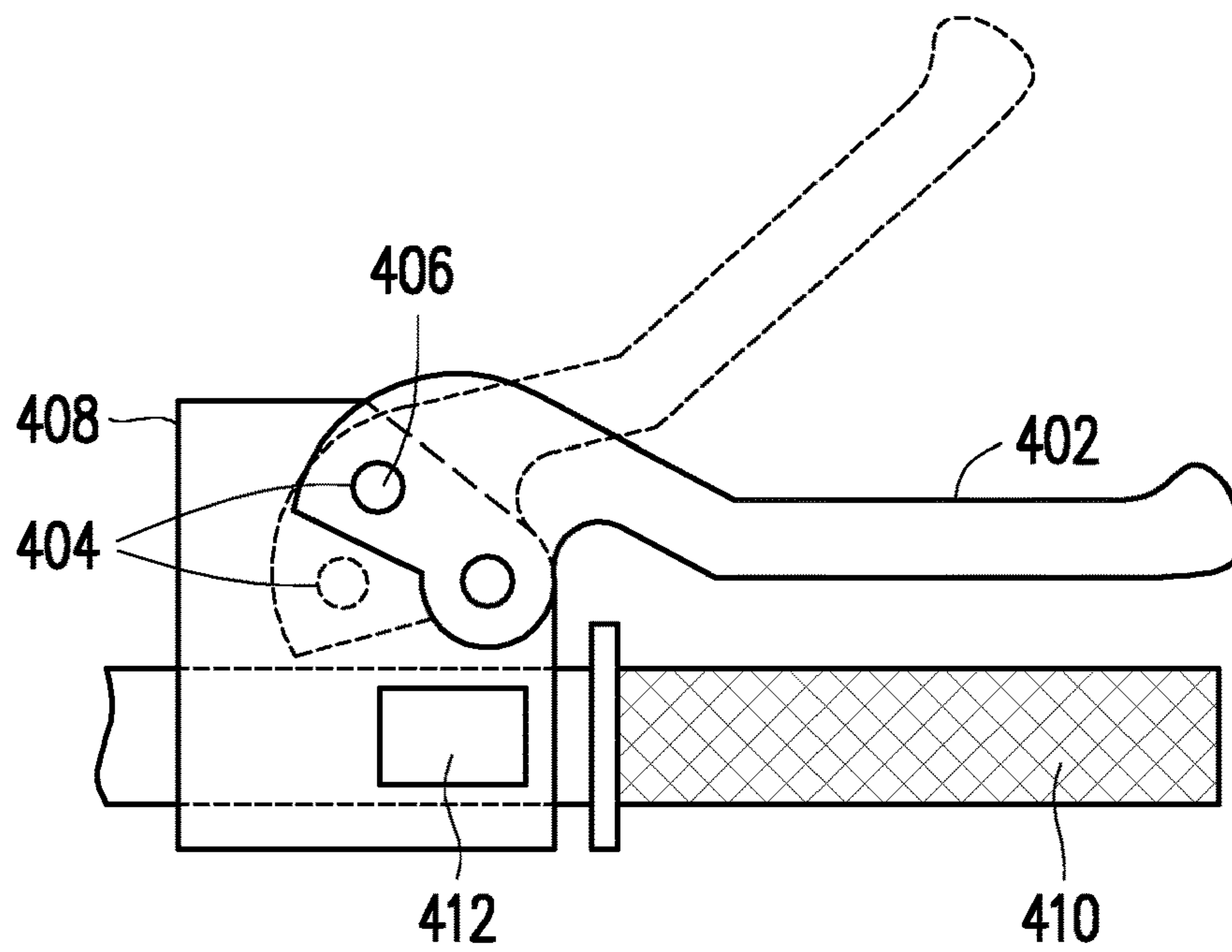


FIG. 4

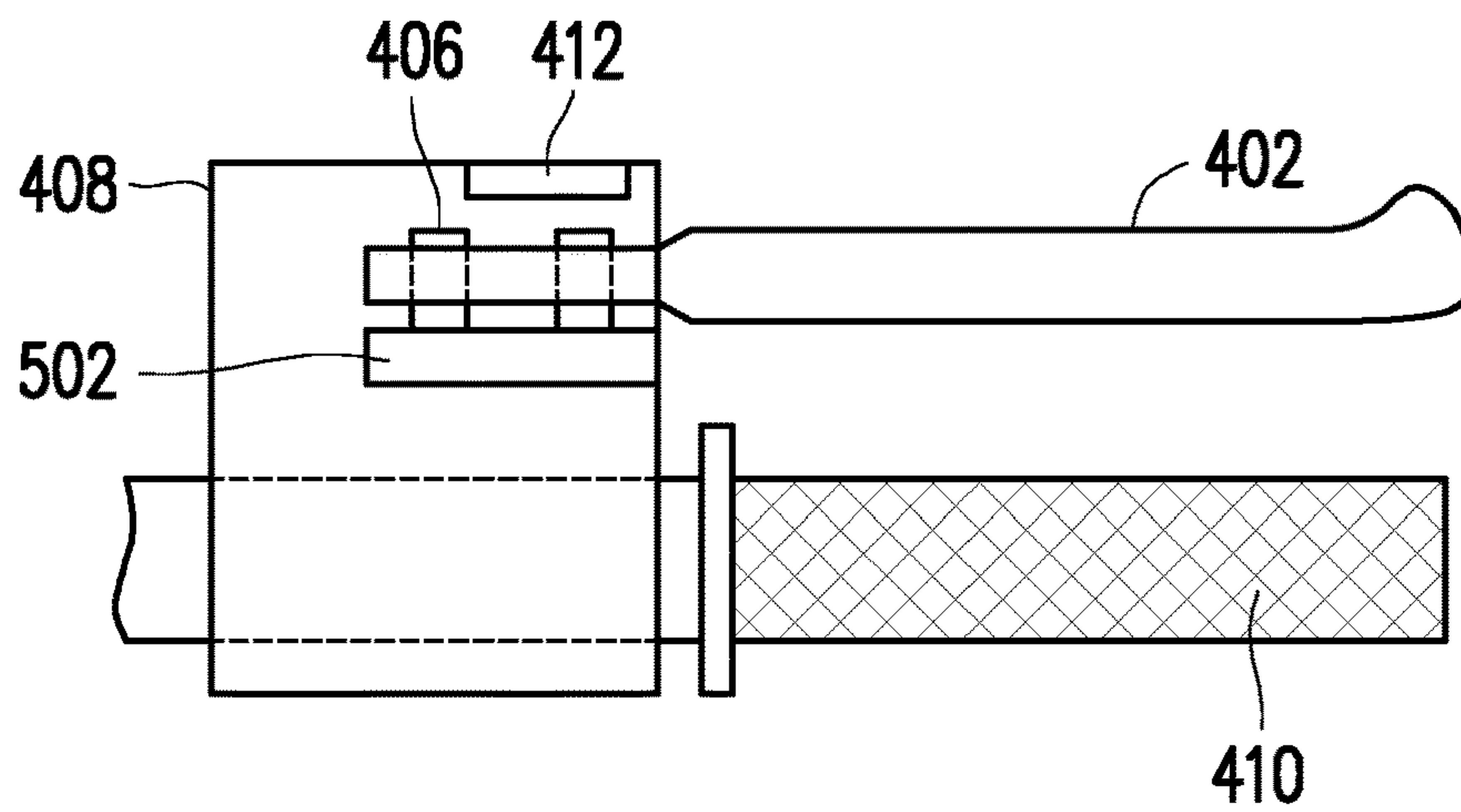


FIG. 5

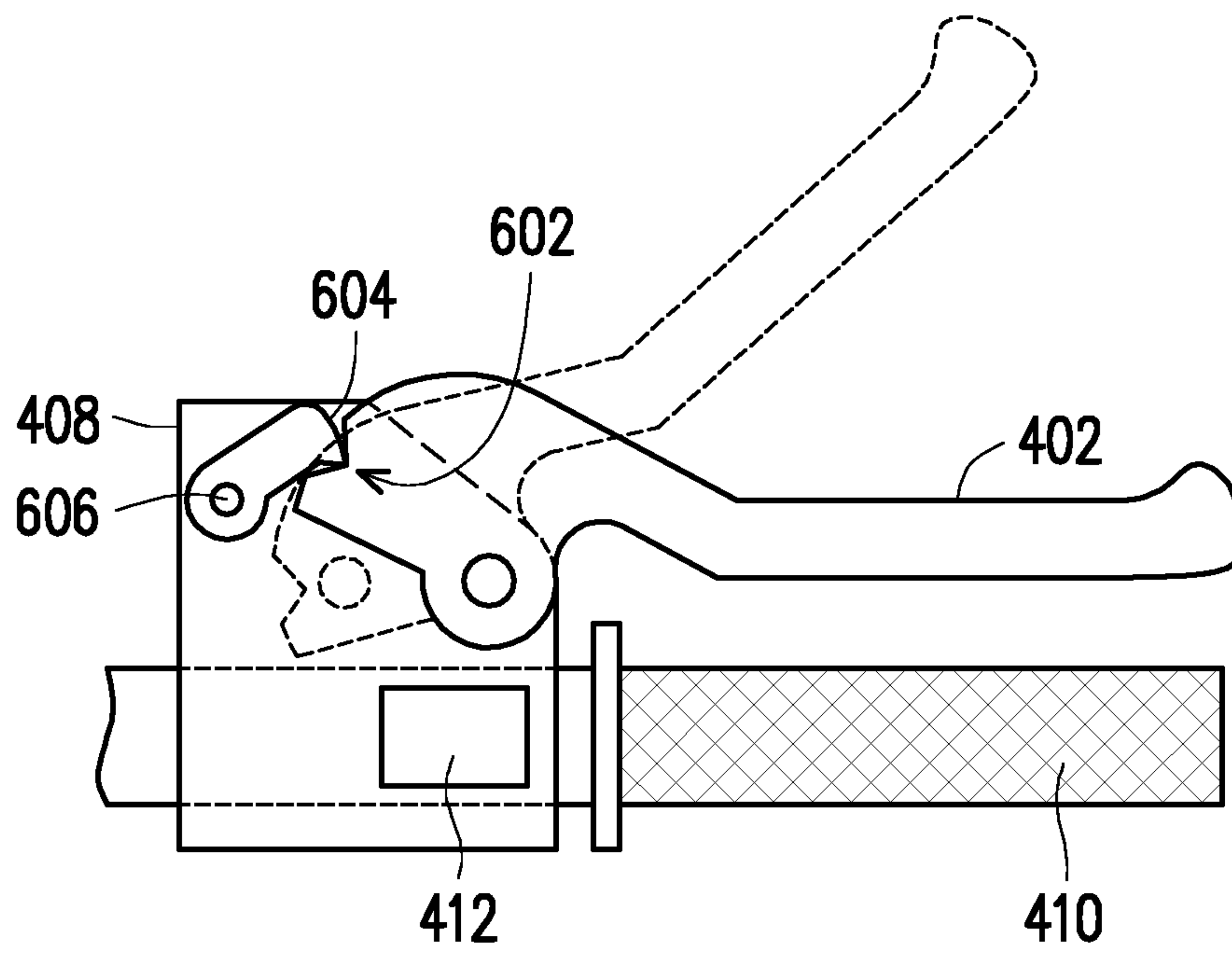


FIG. 6

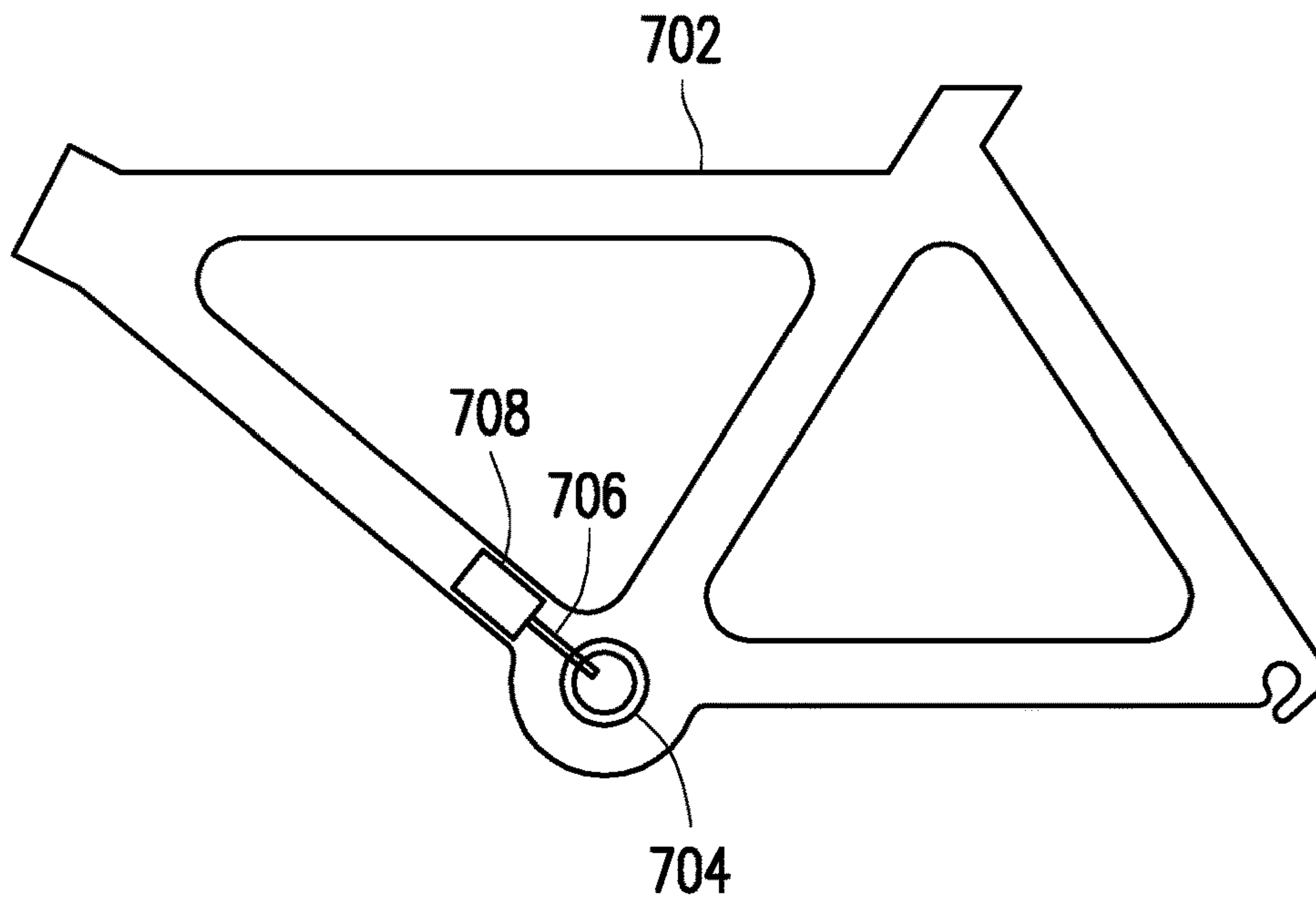


FIG. 7

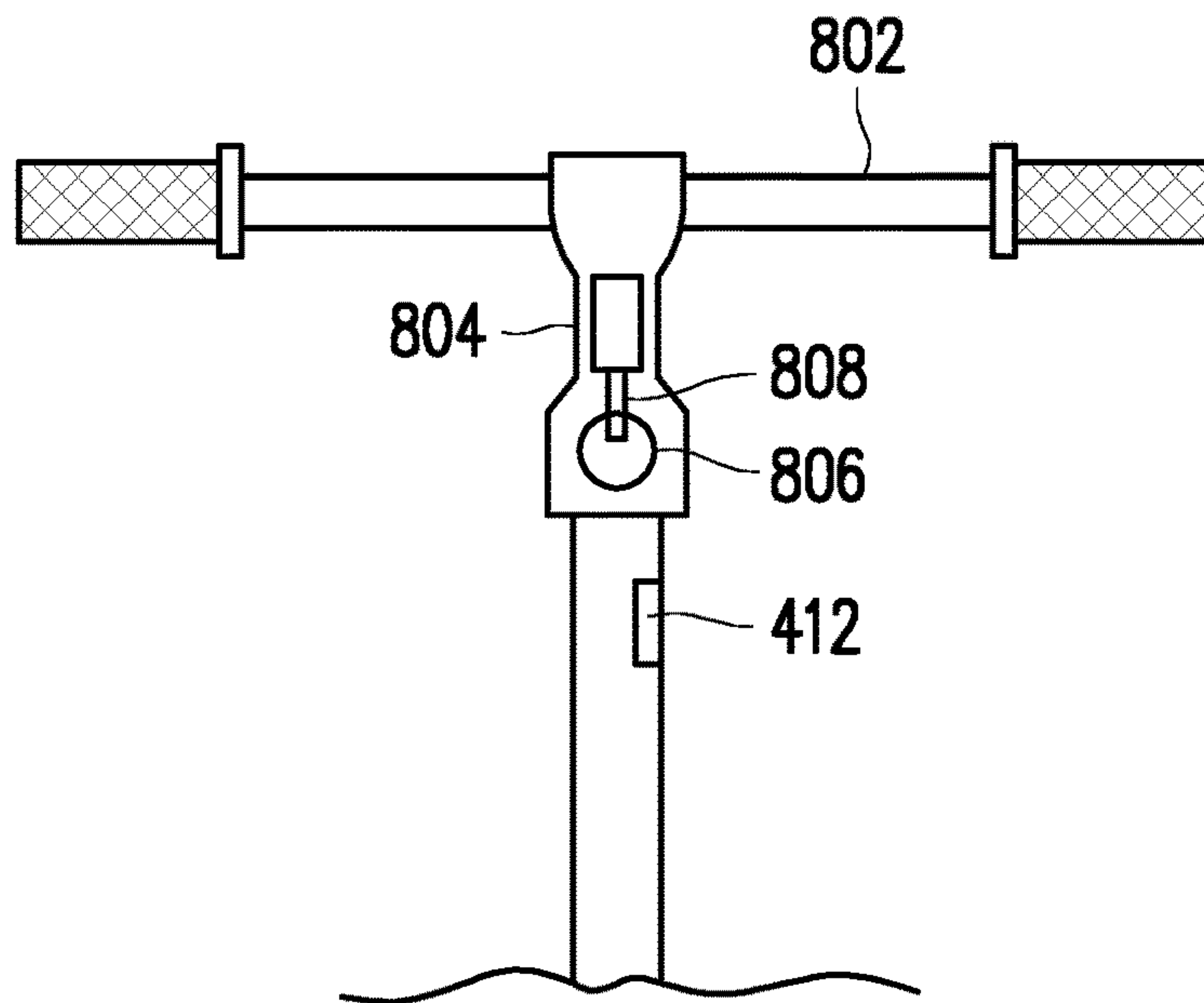


FIG. 8

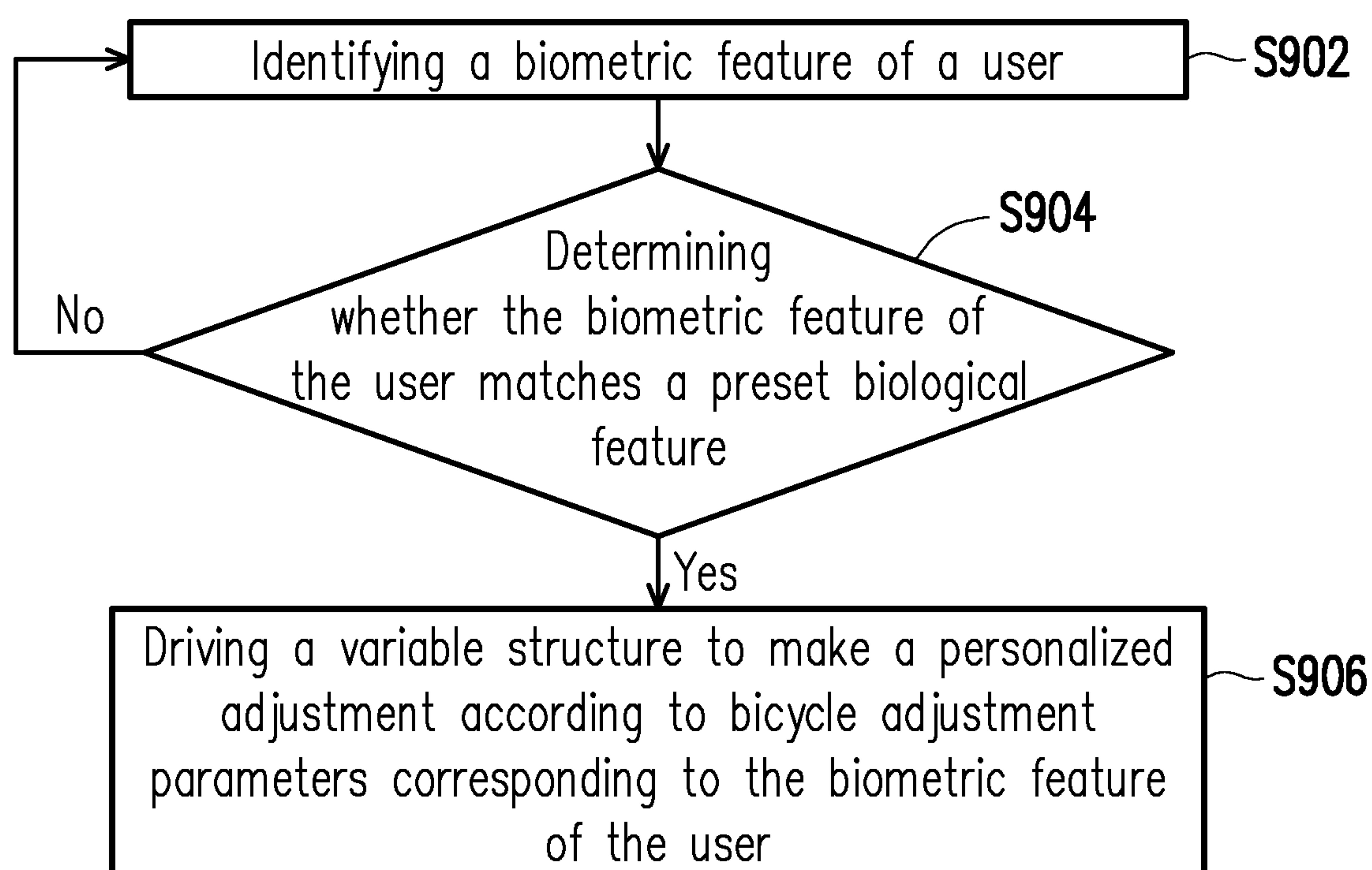


FIG. 9

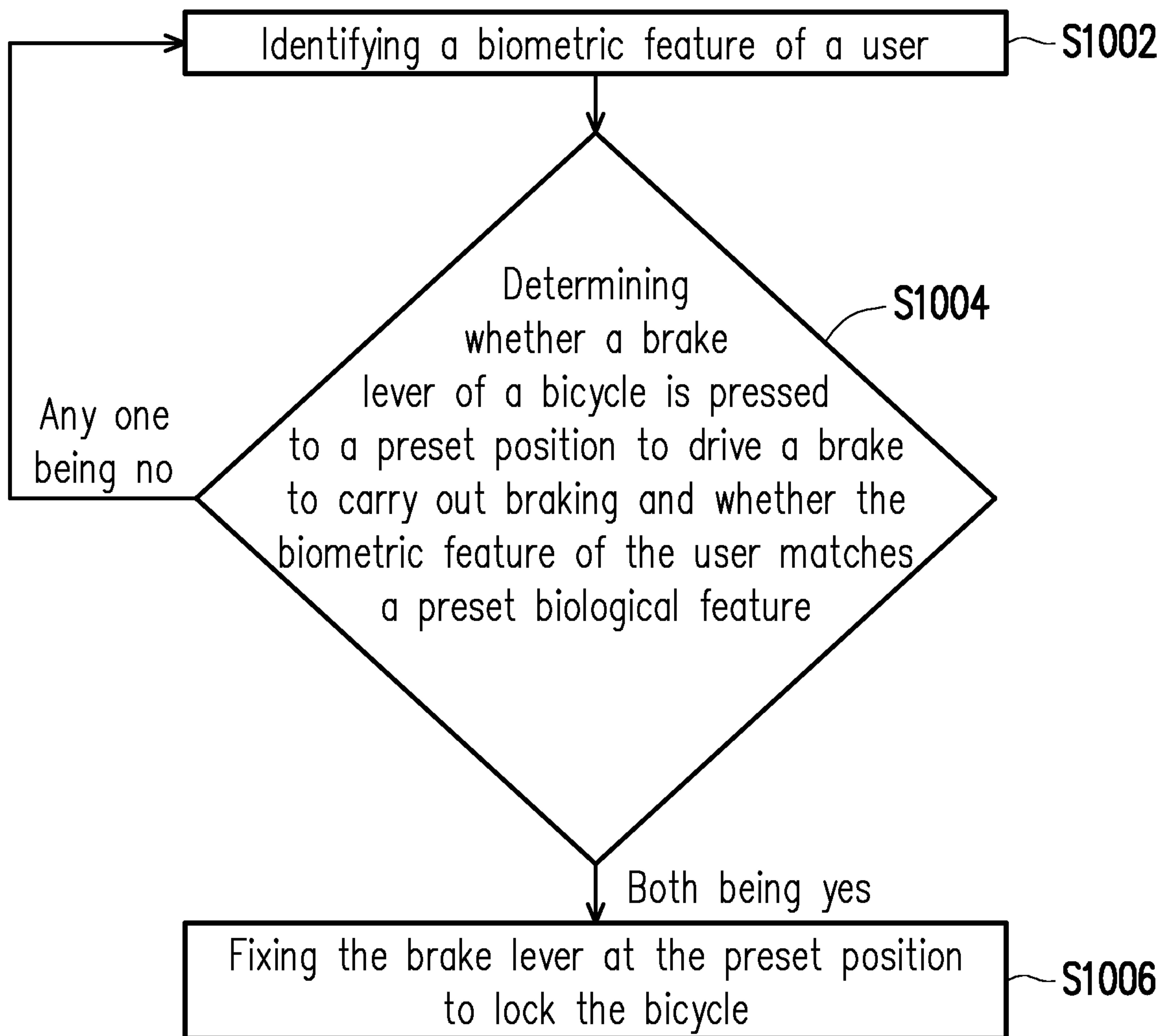


FIG. 10

1

APPARATUS AND METHOD FOR BICYCLE PERSONALIZED ADJUSTMENT

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of Taiwan application serial no. 106146145, filed on Dec. 28, 2017. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND

Technical Field

The disclosure is related to an identification application device, and more particularly, to an apparatus and a method for bicycle anti-theft and personalized adjustment.

Description of Related Art

In the past, approaches for bicycle anti-theft are nothing more than the use of chains, steel locks, mechanical locks and so forth, such anti-theft approaches not only have drawbacks in which the locks are bulky, dirty and inconvenient to carry, but also might fall into the dilemma of unable to unlock the locks if the keys are missing or the passwords are forgotten. Moreover, for riders of different body sizes, bicycle parts are required to be adjusted, such as adjusting a height of a saddle, a height of a stem/handlebar and so forth, to enable the riders to ride the bicycles with a correct riding posture so as to avoid sports injuries. However, conventional adjustment approaches require the adjustments to be carried out manually with experiences and must be repeated back and forth for several times in order to achieve the desired adjustment results.

SUMMARY

The disclosure is directed to an apparatus and a method for bicycle anti-theft and personalized adjustment, which can greatly improve the convenience of use of a bicycle.

An anti-theft apparatus for a bicycle of the disclosure includes a fixing device, a biometric feature identification device, a brake, a brake lever, and a control device. The biometric feature identification device identifies a biometric feature of a user. The brake lever is coupled to the brake, and the brake is operated along with movement of the brake lever. The control device is coupled to the biometric feature identification device and the fixing device. When the brake lever is pressed to a preset position to drive the brake to carry out braking and the biometric feature of the user matches a preset biological feature, the control device controls the fixing device to fix the brake lever at the preset position to lock the bicycle.

In one embodiment of the disclosure, the biometric feature identification device includes a fingerprint sensor disposed on a lever seat of the brake lever.

In one embodiment of the disclosure, the brake lever includes a fixing hole, the fixing device includes a fixing bolt which is movable, and when the brake lever is pressed to the preset position and the biometric feature of the user matches the preset biological feature, the control device controls the fixing device to insert the fixing bolt into the fixing hole so as to fix the brake lever at the preset position.

2

In one embodiment of the disclosure, the brake lever includes an engaging slot, the fixing device includes a positioning member which is movable, and when the brake lever is pressed to the preset position and the biometric feature of the user matches the preset biological feature, the control device controls the fixing device to drive the positioning member to be engaged within the engaging slot so as to fix the brake lever at the preset position.

In one embodiment of the disclosure, the control device further receives a biometric feature information by wireless communication and determines whether the biometric feature information matches the preset biological feature. When the brake lever is pressed to the preset position and the biometric feature information matches the preset biological feature, the control device controls the fixing device to fix the brake lever at the preset position.

In one embodiment of the disclosure, the preset biological feature includes at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

An anti-theft method of the disclosure is adapted for an anti-theft apparatus of a bicycle, and the anti-theft method includes the following steps. A biometric feature of a user is identified. A brake lever of the bicycle is being determined on whether it is pressed to a preset position to drive a brake to carry out braking, and the biometric feature of the user is being determined on whether it matches a preset biological feature. When the brake lever is pressed to the preset position to drive the brake to carry out braking and the biometric feature of the user matches the preset biological feature, the brake lever is fixed at the preset position to lock the bicycle.

In one embodiment of the disclosure, the anti-theft method for the anti-theft apparatus of the bicycle further includes the following steps. A biometric feature information is received by wireless communication. The brake lever of the brake is being determined whether it is pressed to the preset position, and the biometric feature information is being determined on whether it matches the preset biological feature. When the brake lever is pressed to the preset position and the biometric feature information matches the preset biological feature, the brake lever is fixed at the preset position.

In one embodiment of the disclosure, the preset biological feature includes at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

A personalized adjustment apparatus for a bicycle of the disclosure includes a variable structure, a biometric feature identification device and a control device. The biometric feature identification device identifies a biometric feature of a user. The control device is coupled to the variable structure and the biometric feature identification device. When the biometric feature of the user matches a preset biological feature, the control device drives the variable structure to a make personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the personalized adjustment apparatus further includes a safety device, and when the safety device is in a disabled state and the biometric feature of the user matches the preset biological feature, the control device drives the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the safety device includes a brake and a brake lever. The brake lever is coupled to the brake, and the brake is operated along with

movement of the brake lever. When the brake lever is pressed to a preset position to drive the brake to carry out braking, the safety device is entered into the disabled state. When the brake lever is not pressed to the preset position, the safety device is entered into an enabled state.

In one embodiment of the disclosure, the biometric feature identification device includes a fingerprint sensor disposed on a lever seat of the brake lever.

In one embodiment of the disclosure, the variable structure includes a saddle and a bicycle handlebar. The bicycle adjustment parameters include at least one of an adjustment parameters of a height of the saddle, an adjustment parameters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar. The control device drives the variable structure to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the control device further receives a biometric feature information by wireless communication, determines whether the biometric feature information matches the preset biological feature, and drives the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user when the biometric feature information matches the preset biological feature.

In one embodiment of the disclosure, the preset biological feature includes at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

The disclosure further provides a personalized adjustment method for a bicycle, the bicycle includes a variable structure, and the personalized adjustment method includes the following steps. A biometric feature of a user is identified. The biometric feature of the user is being determined on whether it matches a preset biological feature. When the biometric feature of the user matches the preset biological feature, the variable structure is driven to make a personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the bicycle further includes a safety device, and the personalized adjustment method includes the following steps: The safety device is being determined on whether it is in a disabled state, and the biometric feature of the user is being determined on whether it matches the preset biological feature. When the safety device is in the disabled state and the biometric feature of the user matches the preset biological feature, the variable structure is driven to make the personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the safety device includes a brake and a brake lever, and the brake lever is coupled to the brake, and the brake is operated along with movement of the brake lever. When the brake lever is pressed to a preset position to drive the brake to carry out braking, the safety device is entered into the disabled state. When the brake lever is not pressed to the preset position, the safety device is entered into an enabled state.

In one embodiment of the disclosure, the variable structure includes a saddle and a bicycle handlebar. The bicycle adjustment parameters include at least one of an adjustment parameters of a height of the saddle, an adjustment param-

eters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar. The personalized adjustment method includes: driving the variable structure to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the personalized adjustment method includes the following steps. A biometric feature information is received by wireless communication. The biometric feature information is being determined on whether it matches the preset biological feature. When the biometric feature information matches the preset biological feature, the variable structure is driven to make a personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

In one embodiment of the disclosure, the preset biological feature includes at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

According to the above, in the embodiments of the disclosure, when the biometric feature of the user matches the preset biological feature, at least one action of locking the bicycle and driving the variable structure to make personalized adjustments according to the bicycle adjustment parameters corresponding to the biometric feature of the user can be executed, thereby achieving the purpose of improving the convenience of use of the bicycle.

To make the aforementioned more comprehensible, several embodiments accompanied with drawings are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the disclosure and, together with the description, serve to explain the principles of the disclosure.

FIG. 1 is a schematic diagram illustrating a personalized adjustment apparatus for a bicycle according to an embodiment of the disclosure.

FIG. 2 is a schematic diagram illustrating a personalized adjustment apparatus for a bicycle according to an embodiment of the disclosure.

FIG. 3 is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to an embodiment of the disclosure.

FIG. 4 is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to another embodiment of the disclosure.

FIG. 5 is a schematic side view of the personalized adjustment apparatus (anti-theft apparatus) in the embodiment of FIG. 4.

FIG. 6 is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to another embodiment of the disclosure.

FIG. 7 is a schematic diagram illustrating an anti-theft apparatus for a bicycle according to an embodiment of the disclosure.

FIG. 8 is a schematic diagram illustrating an anti-theft apparatus for a bicycle according to another embodiment of the disclosure.

5

FIG. 9 is a schematic diagram illustrating a personalized adjustment method for a bicycle according to an embodiment of the disclosure.

FIG. 10 is a schematic diagram illustrating an anti-theft method for a bicycle according to an embodiment of the disclosure.

DESCRIPTION OF THE EMBODIMENTS

FIG. 1 is a schematic diagram illustrating a personalized adjustment apparatus for a bicycle according to an embodiment of the disclosure. Referring to FIG. 1, the personalized adjustment apparatus for a bicycle may include a biometric feature identification device 102, a control device 104 and a variable structure 106. The control device 104 is coupled to the biometric feature identification device 102 and the variable structure 106. The biometric feature identification device 102 can identify a biometric feature of a user, such as at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user, but not limited thereto. The variable structure 106 may, for example, include adjustable structures such as a saddle and a bicycle handlebar. The control device 104 may, for example, include elements such as a control chip, a processor, a data storage device (e.g., a non-volatile memory) and a driver (e.g., an electric motor) for controlling the variable structure 106 to make adjustments, but not limited thereto.

The control device 104 can determine whether the biometric feature of the user that is identified by the biometric feature identification device 102 matches a preset biological feature. When the biometric feature of the user matches the preset biological feature, the control device 104 can drive the variable structure 106 to make a personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user. The bicycle adjustment parameters may, for example, be at least one of an adjustment parameters of a height of the saddle, an adjustment parameters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar, and the personalized adjustment may, for example, be driving the variable structure 106 to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user. For example, FIG. 2 is a schematic diagram illustrating a personalized adjustment apparatus for a bicycle according to an embodiment of the disclosure. As shown in FIG. 2, the control device 104 can, for example, drive the variable structure 106 to adjust a length L1 of a stem 202 and a length L2 of a steering tube 204 (i.e., the height of the steering tube 204) of the bicycle according to the bicycle adjustment parameters corresponding to the biometric feature of the user, so as to adjust the height and the displacement of the bicycle handlebar. The bicycle adjustment parameters can be stored in the data storage device of the control device for being compared with the biometric feature of the user by the control device 104.

As such, by using the control device 104 to automatically drive the variable structure 106 to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user when the biometric feature of the user matches the preset biological feature, the bicycle can be accurately adjusted to a state

6

suitable for the user to ride on, thereby increasing the convenience of use of the bicycle.

FIG. 3 is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to an embodiment of the disclosure. Referring to FIG. 3, as compared to the embodiment of FIG. 1, the personalized adjustment apparatus of the present embodiment further includes a safety device 302 and a communication device 304, wherein the safety device 302 and the communication device 304 are coupled to the control device 104. The safety device 302 can prevent the user from inadvertently carrying out the adjustment action of the bicycle and adjusting the bicycle under an inappropriate condition (such as during riding). Only when the safety device 302 is in a disabled state and the biometric feature of the user matches the preset biological feature, the control device 104 can drive the variable structure 106 to make a personalized adjustment according to the bicycle adjustment parameters corresponding to the preset biological feature. In the present embodiment, the safety device 302 may, for example, include a brake lever 306, a brake 308 and a fixing device 310, wherein the brake lever 306 is coupled to the brake 308, and the brake 308 is operated along with movement of the brake lever 306. When the brake lever 306 is not pressed to a preset position, the safety device 302 is entered into an enabled state, and when the brake lever 306 is pressed to the preset position to drive the brake 308 to carry out braking, the safety device 302 can enter the disabled state. As such, only when the bicycle is in a braking state (the safety device 302 being in the disabled state) and the biometric feature of the user matches the preset biological feature, the control device 104 can drive the variable structure 106 to make a personalized adjustment to the bicycle, thus improving the safety of bicycle. In some of the embodiments, a sensor (e.g., a piezoelectric sensor) can be configured at the brake lever 306 or the brake 308 for detecting an actuation condition of the brake lever 306 or the brake 308, so that the control device 104 can know whether the brake lever 306 is pressed to the preset position according to a sensing signal of the sensor.

In addition, the fixing device 310 of the present embodiment can be controlled by the control device 104 to fix brake lever 306 at the preset position when the brake lever 306 is pressed to the preset position to drive the brake 308 to carry out braking and the biometric feature of the user matches the preset biological feature, so as to lock the bicycle. Accordingly, the personalized adjustment apparatus of the present embodiment may be used as an anti-theft apparatus for the bicycle. Moreover, when it is to release the bicycle from the lock state, the user can provide the biometric feature thereof to the biometric feature identification device 102 (such as by pressing the fingerprint sensor to provide the fingerprint); when the control device 104 determines that the bicycle is already in the lock state and the biometric feature of the user matches the preset biological feature, the control device 104 controls the fixing device 310 to release the bicycle from the lock state.

Furthermore, the biometric feature of the user, other than being obtained by the biometric feature identification device 102, may also be obtained from an external device with communication function, such as a mobile phone or a tablet PC. For example, the external device may have a biometric feature detection function, such as a fingerprint detection, the communication device 304 of the present embodiment can communicate with the external device via wired or wireless communication to receive a biometric feature information of the user provided by the external device, and the

control device **104** can compare the biometric feature information with the preset biological feature to determine whether to perform a personalized adjustment to the bicycle or to activate the anti-theft function.

In some of the embodiments, the communication device **304** can further provide the user information to the external device, thereby enabling the external device to provide personalized services. For example, when user takes the bicycle entering into a commodity store, the communication device **304** can communicate with a multimedia player of the store to provide personal information of the user (e.g., name, birthday and so forth) to the multimedia player, and the multimedia player can search for a consumer record or keyword search history of the user according to the personal information of the user and provide relevant consumer information to the user (e.g., showing recommended products) according to search results, so as to facilitate the user in purchasing. In addition, when applied the above apparatus and method to bicycle rentals, the communication device **304** of the bicycle can receive member information (may include preset biological features and personalized adjustment parameters of the members) of a bicycle rental store sent from the external device, and thus the members only have to provide their own biometric features for comparing with the preset biological features when renting the bicycles so as to enable the bicycles to automatically carry out the personalized adjustment, thereby greatly improving the convenience of use.

It is to be noted that, in some of the embodiments, the variable structure **106** and the communication device **304** in the embodiment of FIG. **3** may both be configured selectively; when the embodiment of FIG. **3** does not include the adjustable variable structure **106**, the apparatus in the embodiment of FIG. **3** is unable to provide a personalized adjustment function, but still can be used as an anti-theft apparatus for the bicycle.

FIG. **4** is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to another embodiment of the disclosure, and FIG. **5** is a schematic side view of the personalized adjustment apparatus (anti-theft apparatus) in the embodiment of FIG. **4**. Referring to FIG. **4** and FIG. **5**, in the present embodiment, the assembly part of the lever seat **408** is disposed on the handlebar **410**, the biometric feature identification device **102** is disposed on the lever seat **408** beside the brake lever **402**, and the biometric feature identification device **102** may, for example, be implemented by a fingerprint sensor **412**. As shown in FIG. **4**, the fingerprint sensor **412** may be disposed at position which allows a user finger to touch the fingerprint sensor **412** and carry out a fingerprint identification when the user presses the brake lever **402**. The brake lever **402** is combined to the lever seat **408**, and thus can rotate relative to the lever seat **408** so as to enable the brake **308** (FIG. **3**) to carry out braking. The brake lever **402** includes a fixing hole **404**, the fixing device **310** may, for example, include a driver **502** and a fixing bolt **406**, and the driver **502** may, for example, include an electric motor. When the brake lever **402** is pressed to the preset position and the biometric feature of the user matches the preset biological feature, that is, when the brake lever **402** is pressed to a position in which the fixing hole **404** and the fixing bolt **406** are aligned with each other and the biometric feature of the user matches the preset biological feature, the driver **502** can drive the fixing bolt **406** to move and be inserted into the fixing hole **404** so as to fix the brake lever **402** at the preset position, wherein when the brake lever **402** is fixed at the preset position, the bicycle is in the lock state.

Moreover, when it is to release the bicycle from the lock state (braking state), the user can provide the biometric feature thereof to the biometric feature identification device **102** (such as by pressing the fingerprint sensor **412** to provide the fingerprint), and when the control device **104** determines that the bicycle is already in the lock state and the biometric feature of the user matches the preset biological feature, then the control device **104** controls the driver **502** to move the fixing bolt **406** out of the fixing hole **404** to enable the brake lever **402** to return to the position before being pressed, so as to cause the brake **308** to be released from braking, thereby releasing the bicycle from the lock state.

FIG. **6** is a schematic diagram illustrating a personalized adjustment apparatus (anti-theft apparatus) for a bicycle according to another embodiment of the disclosure. Referring to FIG. **6**, a difference between the present embodiment and the embodiment of FIG. **4** and FIG. **5** lies in that, the fixing device **310** of the present embodiment can be replaced by using a positioning member **604** to fix the brake lever **402**. As shown in FIG. **6**, the brake lever **402** of the present embodiment may include an engaging slot **602** which is capable of engaging with the positioning member **604**. When the brake lever **402** is pressed to the preset position and the biometric feature of the user matches the preset biological feature, that is, when the brake lever **402** is pressed to a position in which the engaging slot **602** is suitable for being engaged with the positioning member **604** and the biometric feature of the user matches the preset biological feature, the control device **104** can control the driver (not shown; may, for example, include an electric motor) to drive the rotating shaft **606** to cause the positioning member **604** to rotate and engage into the engaging slot **602**, so as to fix the brake lever **402** at the preset position, wherein when the brake lever **402** is fixed to the preset position, the bicycle is in the lock state. Moreover, when it is to release the bicycle from the lock state (braking state), the user can provide the biometric feature thereof to the biometric feature identification device **102** (such as by pressing the fingerprint sensor **412** to provide the fingerprint), and when the control device **104** determines that the bicycle is already in the lock state and the biometric feature of the user matches the preset biological feature, then the control device **104** controls the driver to drive the rotating shaft **606** into rotation to cause the positioning member **604** to rotate out of the engaging slot **602** to enable the brake lever **402** to return to the position before being pressed, so as to cause the brake **308** to be released from braking, thereby releasing the bicycle from the lock state.

It is to be noted that, in the embodiments of FIG. **4** to FIG. **6**, the control device **104**, in addition to determining whether the brake lever **402** is pressed to the preset position according to the sensing results of the piezoelectric sensor, may also use the electric motor to directly drive the fixing bolt **406** or the positioning member **604** and determine whether the brake lever **402** is pressed to the preset position according to a rotating condition of the electric motor (e.g., a rotation angle).

FIG. **7** is a schematic diagram illustrating an anti-theft apparatus for a bicycle according to an embodiment of the disclosure. Referring to FIG. **7**, in the present embodiment, the fixing device may include a bottom bracket **704**, a fixing bolt **706** and a driver **708**, wherein the fixing bolt **706** and the driver **708** may, for example, be disposed at positions close to the bottom bracket **704** inside a hollow tube structure of the bicycle frame **702**. The bottom bracket **704** has a through hole which is capable for inserting the fixing

bolt 706, and when the fixing bolt 706 is driven by the driver 708 to be inserted into the through hole (as shown in FIG. 7), the bottom bracket 704 as being restricted by the fixing bolt 706 is unable to be rotating and thus causes the crank and chainset connected with the bottom bracket 704 also unable to be rotating anymore, thereby achieving the purpose of anti-theft.

FIG. 8 is a schematic diagram illustrating an anti-theft apparatus for a bicycle according to another embodiment of the disclosure. Referring to FIG. 8, in the present embodiment, the fixing device may include the steering tube 806, the fixing bolt 808 and a driver, wherein the fixing bolt 808 and the driver for driving the fixing bolt 808 may, for example, be disposed inside the stem 804. The bicycle handlebar 802 and the stem 804 can be rotating relative to the steering tube 806, the steering tube 806 has a through hole which is for inserting the fixing bolt 808, and when the fixing bolt 808 is driven by the driver to be inserted into the through hole (as shown in FIG. 8), the bicycle handlebar 802 and the stem 804 as being restricted by the fixing bolt 808 are unable to be rotating relative to the steering tube 806, thus achieving the purpose of anti-theft. In addition, in the present embodiment, the fingerprint sensor 412 may be disposed on the bicycle frame to facilitate in adjusting positions of the bicycle handlebar 802 and the stem 804 when the user presses the fingerprint sensor 412, so as to enable the fixing bolt 808 to be inserted into the through hole smoothly.

FIG. 9 is a schematic diagram illustrating a personalized adjustment method for a bicycle according to an embodiment of the disclosure. Referring to FIG. 9, it can be known from the previous embodiments that the personalized adjustment method for a bicycle may include the following steps. Firstly, a biometric feature of a user is identified (step S902). Next, the biometric feature of the user is being determined on whether it matches a preset biological feature (step S904), wherein the preset biological feature may, for example, include at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user, but not limited thereto; in some of the embodiments, biometric feature information of the user may also be received by wireless communication and be used for determining whether the biometric feature of the user matches the preset biological feature. When the biometric feature of the user matches the preset biological feature, a variable structure is driven to make a personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user (step S906), wherein the variable structure may, for example, include a saddle and a bicycle handlebar, the bicycle adjustment parameters may include at least one of an adjustment parameters of a height of the saddle, an adjustment parameters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar, and the personalized adjustment may, for example, drive the variable structure to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user. On the contrary, if the biometric feature of the user does not match the preset biological feature, then returning back to the step S902 to continue identifying of the biometric feature of the user.

In some of the embodiments, determinations on whether a safety device is in a disabled state and whether the biometric feature of the user matches the preset biological feature may further be carried out, wherein only when the safety device is in the disabled state and the biometric feature of the user matches the preset biological feature, the variable structure can be driven to make a personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user. The safety device may, for example, include a brake and a brake lever, and the brake lever is coupled to the brake, and the brake is operated along with movement of the brake lever, wherein when the brake lever is pressed to the preset position to drive the brake to carry out braking, the safety device is entered into the disabled state, and when the brake lever is not pressed to the preset position, the safety device is entered into an enabled state.

FIG. 10 is a schematic diagram illustrating an anti-theft method for a bicycle according to an embodiment of the disclosure. According to the previous embodiments, it can be known that the anti-theft method for the bicycle can include the following steps. Firstly, a biometric feature of a user is identified (step S1002). Next, a brake lever of the bicycle is being determined on whether it is pressed to the preset position to drive a brake to carry out braking and the biometric feature of the user is being determined on whether it matches the preset biological feature (step S1004), wherein the preset biological feature may, for example, include at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user, but not limited thereto; in some of the embodiments, biometric feature information of the user may also be received by wireless communication and be used for determining whether the biometric feature of the user matches the preset biological feature. When the brake lever is pressed to the preset position to drive the brake to carry out braking and the biometric feature of the user matches the preset biological feature, the brake lever is to be fixed at the preset position to lock the bicycle (step S1006). On the contrary, if the brake lever is not pressed to the preset position or the biometric feature of the user does not match the preset biological feature, then returning back to the step S1002 to continue identifying the biometric feature of the user.

In summary, in the embodiments of the disclosure, when the biometric feature of the user matches the preset biological feature, at least one action of locking the bicycle and driving the variable structure to make personalized adjustments according to the bicycle adjustment parameters corresponding to the biometric feature of the user can be executed, thereby achieving the purpose of improving the convenience of use of the bicycle.

It will be apparent to those skilled in the art that various modifications and variations can be made to the disclosed embodiments without departing from the scope or spirit of the disclosure. In view of the foregoing, it is intended that the disclosure covers modifications and variations provided that they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A personalized adjustment apparatus for a bicycle, comprising:
 - a variable structure;
 - a safety device;
 - a biometric feature identification sensor, identifying a biometric feature of a user; and
 - a control device comprising a driving motor, coupled to the variable structure and the biometric feature identi-

11

fication sensor, wherein when the safety device is in a specific state and the biometric feature of the user matches a preset biological feature, the driving motor of the control device drives the variable structure to make a personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user.

2. The personalized adjustment apparatus as recited in claim 1, wherein when the safety device is in a disabled state and the biometric feature of the user matches the preset biological feature, the driving motor of the control device drives the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

3. The personalized adjustment apparatus as recited in claim 2, wherein the safety device comprises:

a brake; and

a brake lever, coupled to the brake, the brake is operated along with movement of the brake lever, wherein when the brake lever is pressed to a preset position to drive the brake to carry out braking, the safety device is entered into the disabled state, and when the brake lever is not pressed to the preset position, the safety device is entered into an enabled state.

4. The personalized adjustment apparatus as recited in claim 3, wherein the biometric feature identification sensor comprises a fingerprint sensor disposed on a handlebar beside the brake lever.

5. The personalized adjustment apparatus as recited in claim 1, wherein the variable structure comprises a saddle and a handlebar, the bicycle adjustment parameters comprise at least one of an adjustment parameters of a height of the saddle, an adjustment parameters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar, and the control device drives the variable structure to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

6. The personalized adjustment apparatus as recited in claim 1, wherein the control device further receives a biometric feature information by wireless communication, determines whether the biometric feature information matches the preset biological feature, and drives the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user when the biometric feature information matches the preset biological feature.

7. The personalized adjustment apparatus as recited in claim 1, wherein the preset biological feature comprises at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

8. A personalized adjustment method for a bicycle, the bicycle comprising a variable structure and a safety device, and the personalized adjustment method comprising:

identifying a biometric feature of a user;

12

determining whether the biometric feature of the user matches a preset biological feature; and

when the safety device is in a specific state and the biometric feature of the user matches the preset biological feature, driving the variable structure to make a personalized adjustment according to bicycle adjustment parameters corresponding to the biometric feature of the user.

9. The personalized adjustment method as recited in claim 8, comprising:

determining whether the safety device is in a disabled state and whether the biometric feature of the user matches the preset biological feature; and

when the safety device is in the disabled state and the biometric feature of the user matches the preset biological feature, driving the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

10. The personalized adjustment method as recited in claim 9, wherein the safety device comprises a brake and a brake lever, the brake lever is coupled to the brake and the brake is operated along with movement of the brake lever, when the brake lever is pressed to a preset position to drive the brake to carry out braking, the safety device is entered into the disabled state, and when the brake lever is not pressed to the preset position, the safety device is entered into an enabled state.

11. The personalized adjustment method as recited in claim 8, wherein the variable structure comprises a saddle and a bicycle handlebar, the bicycle adjustment parameters comprise at least one of an adjustment parameters of a height of the saddle, an adjustment parameters of an angle of the saddle and an adjustment parameters of a displacement of the saddle and an adjustment parameters of a height of the bicycle handlebar, an adjustment parameters of an angle of the bicycle handlebar and an adjustment parameters of a displacement of the bicycle handlebar, and the personalized adjustment method for a bicycle comprises:

driving the variable structure to adjust at least one of the height, the angle and the displacement of the saddle and the height, the angle and the displacement of the bicycle handlebar according to the bicycle adjustment parameters corresponding to the biometric feature of the user.

12. The personalized adjustment method as recited in claim 8, comprising:

receiving a biometric feature information by wireless communication;

determining whether the biometric feature information matches the preset biological feature; and

driving the variable structure to make the personalized adjustment according to the bicycle adjustment parameters corresponding to the biometric feature of the user when the biometric feature information matches the preset biological feature.

13. The personalized adjustment method as recited in claim 8, wherein the preset biological feature comprises at least one of a fingerprint, a palm print, a vocal print and vascular markings of the user.

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